to a matter of pure calculation. One thing is certain, till this is done designs of large air-ships for the wholesale transport of passengers, officers and cargo are not of the slightest value; their designers would do better to study mathematics, and help in the heavy work of calculation still requiring to be done."

FOR the purpose of testing whether change of chemical structure ever results in change of weight, Landolt carried out a number of experiments in the years 1890–92. Using a variety of reactions, he made a careful series of weighings, both before and after chemical combination, of substances sealed in glass tubes, but the results were inconclusive. In three reactions with silver sulphate and ferrous sulphate, producing silver and ferric sulphate, the apparent loss of weight was, on the average, more than nine times as great as the probable error of weighing, and a similar apparent loss was indicated as the result of six reactions between iodic acid and hydriodic acid. In some other reactions, however, the observed change of weight was sometimes positive and sometimes negative. A similar set of weighings for another silver reaction closely related to the one used by Landolt have now been made by Fernando Sanford and Lilian E. Ray, and are described in the *Physical Review* (October). The reaction used was the reduction of silver from an ammonia solution of the oxide, by means of grape sugar. The weighings show greater irregularities than those of Landolt, but they are still accurate enough to justify the authors' conclusion that the reaction used by them was unaccompanied by any such change of weight as was observed in the similar reaction studied by Landolt.

THE September number of *Terrestrial Magnetism*, the publication of which has been unavoidably delayed, contains, among other contributions, a paper "Ueber die Fehler bei Erdmagnetischen Messungen," by H. Wild, and a translation of Prof. Max Eschenhagen's paper "On Minute, Rapid, Periodic Changes of the Earth's Magnetism," already noted in NATURE.

A COPY of an inaugural address on "Advances in Biological Science during the Victorian Era," recently delivered by Mr. Isaac C. Thompson as president of the Liverpool Biological Society, has been sent to us. The address is an instructive review of the most prominent biological work of the past sixty years, and the nature of it shows that the Liverpool Biological Society ranks high among the scientific bodies of the city.

MR. ALFRED HARKER's excellent little guide to the study of rocks in thin slices under the microscope, published under the title "Petrology for Students" by the Cambridge University Press, has reached a second edition. The book has been revised throughout, and more attention has been given to American examples, at least among the igneous rocks. No better introduction to the study of petrology could be desired than is afforded by Mr. Harker's volume.

THE Essex Field Club will publish about Christmas, as one of their "Special Memoirs," a volume on the "Mammals, Reptiles and Fishes of Essex," by Dr. Henry Laver, one of the Vice-Presidents of the Society. Taken in conjunction with Christy's "Birds of Essex," issued by the Club in 1891, it will afford a complete guide to the vertebrate fauna of the county. The work will be illustrated by original drawings by Major Bale, of Colchester, and Mr. H. A. Cole, of Buckhurst Hill, depicting some of the more interesting species and their haunts in the county.

THE magnetic observations made at 509 places in Asia and Europe during the period 1867–1894, by Dr. H. Fritsche, Emeritus Director of the Russian Observatory at Pekin, have been brought together and published as a pamphlet in which the whole of the MS. is reproduced in facsimile. The first part of the pamphlet deals with the formulæ used in the calculation of horizontal intensity, and following it are tables showing the magnetic elements at 509 places in Europe, Siberia, and China, the longitudes and latitudes of the places being given, and also the dates of observation. Magnetic anomalies are discussed, and two local anomalies—one near the island of Ioussar-oe in Finland, and another near Moscow, are described in detail, and illustrated by three maps.

WITH reference to the note on p. 59 of our issue of November 18, as to the storm signals used by various maritime countries, which was based upon information contained in the U.S. Pilot Chart of the Pacific Ocean for November, we have received a note from Admiral Capello pointing out that, in addition to the use of flags of the Commercial Code and occasional semaphoric signals for the purpose of giving notice of the state of the weather between the Bay of Biscay, Madeira and Gibraltar, to passing vessels that may require it, the drum and cone signals adopted by the late Admiral FitzRoy are regularly hoisted at the semaphores to notify the probable approach of stormy weather.

THE additions to the Zoological Society's Gardens during the past week include a Black-handed Spider Monkey (*Ateles geoffroyi*, ♀) from Central America, presented by Mr. F. Colsell; two White-naped Weasels (*Pœcilogale albinucha*) from South Africa, presented by Mr. W. Champion; two Flat-backed Terrapins (*Cyclemmys platynota*) from Johore, Malay Peninsula, presented by Mr. S. S. Flower; two Chameleons (*Chamæleon vulgaris*) from North Africa, presented by Mr. Horace Dibley; two Ring-tailed Coatis (*Nasua rufa*), a Kinkajou (*Cercoleptes caudivolvulus*), a Punctated Agouti (*Dasyprocta punctata*), a Globose Curassow (*Crax globicera*) from British Honduras; two Vervet Monkeys (*Cercopithecus lalandii*, ♂ ♀) from South Africa, deposited; two Scaup Ducks (*Fuligula marila*, ♂ ♀), European, purchased.

DR. C. BÖRGEN asks us to state that in his letter on "The Law of Divisibility," which appeared in NATURE of November 18 (p. 54), he should have written $\Sigma(a_{v+a-1}$ instead of $\Sigma(a_{v-a+1}$.

OUR ASTRONOMICAL COLUMN.

METEORS (GEMINIDS).—The interest awakened by the recent expectation of a brilliant return of the Leonid meteors may induce many to make observations of other showers. It may be well, therefore, to remember that from the 9th to the 12th inst. the fairly good shower of the Geminids takes place. The radiant point is situated near Castor in R.A. 7h. and north declination 32°. In the years 1885 and 1892 there were remarkably good displays.

o CETI (MIRA).—In this column last week reference was made to the brightness of "Mira" near its maximum. Further observations made at the Solar Physics Observatory, South Kensington, show that, as at previous times, the light curve of this star is subject to fluctuations near maximum, but the star is still about the third magnitude, being considerably brighter than γ Ceti (3·38 N.O.U.). Only visual observations of the spectrum have been possible in consequence of the troubled state of the weather, which has not allowed of the long exposures necessary to secure the violet portion of the spectrum; the visual observations show the same bands as recorded by Sir Norman Lockyer at Westgate in 1888 (NATURE, vol. xxxviii. p. 61). This year the star will be well situated for observation for a considerable time after its brightest period, before being lost in the twilight, as it is now on the meridian about 9.30 p.m. We hope later to be able to give some additional facts as to the change which takes place in the invisible portion of the spectrum in passing from maximum to minimum.

THE COMPANION OF SIRIUS.—Prof. Burnham, using the 36-inch Lick refractor, was the last to observe the companion of Sirius before its perihelion passage. The observation was by no

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means an easy one, the distance being measured as 4″·19 (1890 April 22). Since that date, especially during the last two years, several observers have attempted to catch a glimpse of this body with varying results. Dr. See, in a communication on this subject (*Astr. Journal*, No. 418), points out that although several objects have been measured which were thought at the time to be the companion in question, there seems to be evidence to show that in some cases these were spurious. There is, however, no doubt that the companion can now be seen, and several measures show that it is following with great accuracy the orbit which Dr. See computed for it in his work on "Researches on the Evolution of the Stellar Systems" (vol. i. p. 84). The satisfactory agreement of the observed and computed positions shows that this orbit is of a high degree of accuracy, and will be serviceable for many years to come. The following ephemeris, taken from Dr. See's paper, gives the position angles and distances for the next three years:—

	Pos. angle.	Distance.
	°	″
1897·70	174·5	4·59
1898·20	169·0	4·72
1899·20	158·9	4·97
1900·20	149·5	5·25

A LIBERAL GIFT TO ASTRONOMY.—It was briefly announced in last week's NATURE that Miss Alice Bache Gould, daughter of the late Dr. Gould, had entrusted to the U.S. National Academy of Sciences a fund of 20,000 dollars; we are now able to state the precise conditions under which the gift was made. The money given by Miss Gould is to be known as the Benjamin Apthorp Gould Fund, and the net income of the fund is to be expended under the direction of Prof. Lewis Boss of Albany, Dr. Seth C. Chandler of Cambridge, and Prof. Asaph Hall of Washington, who are constituted by Miss Gould a board of directors for that purpose. The income is to be devoted to the prosecution of researches in astronomy by assisting observers and investigators in such manner and sums as may be agreed upon by all three of the directors.

In a letter to the directors, Miss Gould writes:—"My object in creating the fund is two-fold; on the one hand to advance the cause of astronomy, and on the other to honour my father's memory and to ensure that his power to accomplish scientific work shall not end with his own life. . . . Throughout my father's life his patriotic feeling and scientific ambition were closely associated, and I wish therefore that a fund bearing his name should be used primarily for the benefit of investigators in his own country or of his own nationality. I recognise, however, that sometimes the best possible service to American science is in the maintenance of close communion between the scientific man of Europe and of America, and that therefore, even while acting in the spirit of the above restriction, it may occasionally be best to apply this money to the aid of a foreign investigator working abroad."

One idea in the creation of the fund is that it may relieve the directors of the Bache fund of the Academy of some of their astronomical expenses, so that they may be able to devote more of their money to other departments. Miss Gould expresses a strong wish that astronomy of precision shall be distinctly preferred to work in astrophysics, first, because of Dr. Gould's personal preference, and, second, because of the existence of endowments for astrophysics. The fund is distinctly intended for the advancement and not for the diffusion of scientific knowledge; actual expenses of investigation are to be considered rather than the personal support of investigators, and the directors are advised not to cover with their grants the field provided for by existing endowments.

CORAL BORING AT FUNAFUTI.[1]

THE boring at Funafuti, according to the latest advices, had reached a depth of 643 feet. Prof. David's report is transcribed from notes made during the progress of the work, and gives his first impressions of the materials brought up, down to a depth of 557 feet, which had been reached when he quitted the island to return to his duties at Sydney, leaving the work in charge of his assistant. The latest advices informed him that the boring was arrested at 643 feet, but as it was hoped this was only for a time, we are daily expecting to hear yet more gratifying news. His last letters, received during the present week, give a few particulars of the materials pierced between 557 and 643 feet. The work, states Prof. David, often presented most serious difficulties, which would probably have frustrated their efforts, but for the experience gained on the former occasion.

The bore-hole is situated about half a mile north-east of the Mission Church, and its height above sea level is about 1 foot above high water mark at spring tides. The diameter is 5 inches down to 68 feet; it is lined with 5-inch tubing down to 118 feet, and 4-inch from surface to 520 feet, so that on September 6 a 4-inch core was being obtained.

The following is a general description of the materials pierced:—For about a yard at the top there was a hard coral breccia. This was followed down to a depth of 40 feet by "coral reef rock," into the composition of which *Heliopora cerulea*, with spines of echinids and nullipores entered largely, the last predominating over the coral at from 15 to 20 feet. From 40 to 200 feet came more or less sandy material, but with a variable quantity of corals. These were scattered through the sand (calcareous and of organic origin; foraminifera, at about 40 feet, making from one-half to two-thirds of the whole) sometimes as fragments (forming occasionally a kind of rubble), but sometimes in the position of growth. Between 120 and 130 feet, and from about 190 to 200 feet, the material is described as fairly compact coral rock, so that very probably reefs *in situ*, though of no great thickness, were pierced at these depths. The sand appears to be largely derived from coral, but foraminifera occur, sometimes in abundance; so too do nullipores, and here and there spines of echinids. Towards 150 feet signs of change begin to appear in the corals, and these become more conspicuous as the boring approaches its greatest depth. In such case, if I understand rightly, some of the branching corals crumble away and are represented only by casts, while others remain, the surrounding matrix becoming solid, cemented apparently by calcite. Below 202 feet a decided change takes place in the character of the deposit. All above this seems to be largely composed of material derived from corals, with occasional rather brief interludes of true reef; and this mass, measuring, as said above, rather over 200 feet in thickness, may be termed the first or uppermost formation. Below this, down to about 373 feet, sandy material distinctly dominates, which sometimes is almost a calcareous mud. Still even there coral fragments and rubble occasionally appear, and now and then a few isolated corals. Other organisms may be detected, including nullipores, foraminifera, and mollusca; but until this material has been examined microscopically, it would be premature to attempt any precise statement. This mass, in thickness about 170 feet, may be termed the second or middle formation. It is not reef, though obviously produced in the vicinity of a reef. Below 370 feet is the third or lowest zone; in this beds composed of broken coral become frequent, which are intercalated with masses of dead coral, though sandy bands also occur. The character of the material suggests that it has been formed in the immediate vicinity of a reef, which has occasionally grown out laterally, though only for a time, and has built up a layer of true reef, from 2 to 3 feet in thickness, upon a mass of detrital coral. In one place the rock is specially noted as "hard," and hereabouts even the shells of gastropods have perished, only their casts remaining. From 526 to 555 feet the bore passed through fairly compact and (in places) very dense and hard "coral limestone" and "cavernous coral rock," in which dendroid forms were numerous. As regards the part between 557 feet and 643 feet only brief information is to hand, but Prof. David states that it is reported to be chiefly coral limestone, hard and dense, with occasional soft bands of coral sand or coral rubble. Thus the third, or lowest zone, about 270 feet in thickness, corresponds apparently with the first, but it seems to contain larger and more numerous masses of true reef.

Prof. David has also forwarded with his latest letters a section of the boring and of the exterior form of the island, down to about 730 fathoms: the one drawn from his notebook, the other from Captain Field's record of soundings. From this I gather the following particulars:—The bore-hole is, roughly speaking, rather over 100 yards from the margin of the ocean, and about 165 yards from that of the lagoon; it is about 240 yards from the spot where a sounding of 10 fathoms was obtained,

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[1] "Summary of Prof. Edgeworth David's Preliminary Report on the Results of the Boring in the Atoll of Funafuti." Communicated by Prof. T. G. Bonney, F.R.S., Vice-Chairman of the Coral Reef Boring Committee. Read at the Royal Society, November 25.

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